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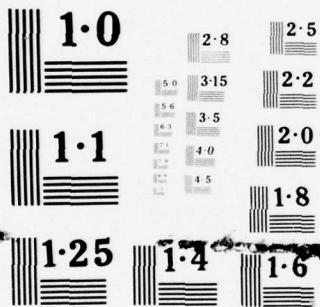
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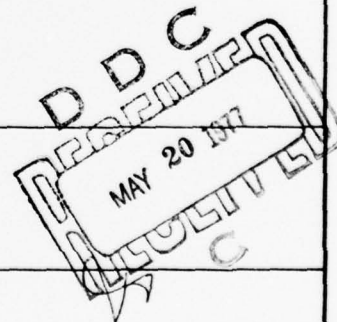
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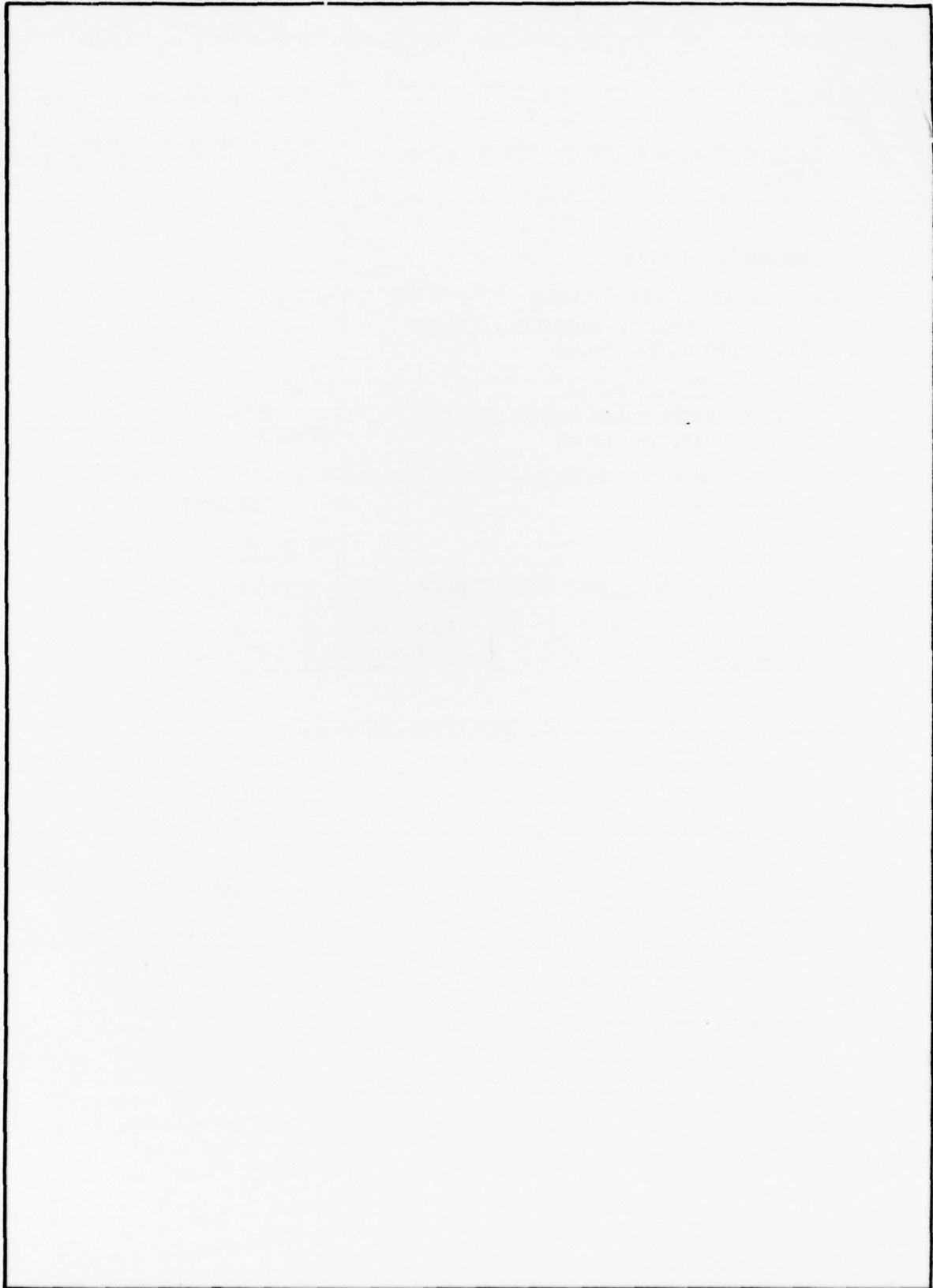
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STUDY TITLE: A LOOK INTO THE EFFECTIVENESS OF TAC IOT&E

STUDY GOALS: To determine the quality of TAC's recent IOT&E performance while working with the developer (AFSC) under the relatively new concept of combined DT&E/IOT&E.

STUDY REPORT ABSTRACT

The combined DT&E/IOT&E concept instituted in 1971 by David Packard is explained. An investigation of IOT&E effectiveness is performed through collecting and analyzing data from several sources. Interviews with OT&E personnel in HQ, USAF and questionnaires from AFSC program managers and TAC IOT&E project managers were all used. Data indicates positive attitudes and high acceptance of the new combined testing concept. Definite group opinions verified through statistical analysis indicate excellent IOT&E performance by TAC. Recommend further emphasis be placed on combining IOT&E with DT&E, although schedule and cost might not normally warrant doing so. Increased interaction between the user and developer appears to offer many advantages.

KEY WORDS: MATERIEL EVALUATION AERONAUTICAL EQUIPMENT OPERATIONAL TESTING
TAC

NAME, RANK, SERVICE

Thomas H. Julian, GS-13, DAFC

CLASS

PMC 74-1

DATE

May 1974

DEFENSE SYSTEMS MANAGEMENT SCHOOL



PROGRAM MANAGEMENT COURSE INDIVIDUAL STUDY PROGRAM

A LOOK INTO THE EFFECTIVENESS OF
TAC IOT&E

STUDY REPORT
PMC 74-1

Thomas H. Julian
GS-13 DAFC

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A LOOK INTO THE EFFECTIVENESS
OF TAC IOT&E

An Executive Summary
of a
Study Report
by

Thomas H. Julian
GS-13 DAFC

May 1974

Defense Systems Management School
Program Management Course
Class 74-1
Fort Belvoir, Virginia 22060

EXECUTIVE SUMMARY

Following considerable criticism, changes in the Operational Test and Evaluation (OT&E) policy were established by Mr. David Packard in 1971. This created a new test term called Initial Operational Test and Evaluation (IOT&E). IOT&E is often performed by the user prior to system development phase completion. The user report is used as one of the primary factors in determining a system's future fate. In the case of major programs, it is a requirement prior to the Defense Systems Acquisition Review Council (DSARC) conducted prior to a production decision. Due to development program schedules and funding, most IOT&E evaluations are conducted simultaneously with the Development Test and Evaluation (DT&E). In this situation, we have two commands working together in a joint DT&E/IOT&E effort, with the overall program control remaining with the developing command. This report concentrates on implementation aspects of recent joint DT&E/IOT&E programs conducted by the Air Force Systems Command (AFSC) and the Tactical Air Command (TAC).

The primary purpose was to gain some insight into how well the combined testing concept is working out. The study did not concentrate on any one type or dollar value program, but instead looks across-the-board at the effectiveness of all recent TAC IOT&E efforts.

Data was collected by both personal interviews and questionnaires. Interviews were conducted within the Directorate of Operations, Deputy Chief of Staff, USAF. Questionnaires were sent to both AFSC DT&E program managers and TAC IOT&E project managers who possess experience with combined DT&E/IOT&E. Since the Tactical Air Warfare Center (TAWC) is TAC's

primary OT&E test agency, TAC questionnaires were sent to individuals in this center.

Results of both interviews and questionnaires revealed a definite positive attitude toward the combined testing concept. In addition, interviews were most helpful in providing background and rationale for the creation of the new OT&E group called Air Force Test and Evaluation Center (AFTEC). It was learned that the establishment of AFTEC had no relation to past performance of TAC in accomplishing effective IOT&E.

Questionnaire responses were compiled and analyzed statistically first to determine if a group opinion to a particular question was present. Another statistical test compared the mean responses from questions common to both AFSC and TAWC. It was interesting to note that of all questions which exhibited group opinions, the opinion expressed was toward a positive rating of IOT&E effectiveness.

It was concluded that the improved two-way exchange between AFSC and TAWC (TAC) afforded by the combined DT&E/IOT&E has been widely accepted. It was further concluded that TAC/TAWC IOT&E performance has been excellent.

It is recommended that more emphasis be placed on combined DT&E/IOT&E testing to resolve earlier the differences between user and developer. It is also recommended that the using command designate a project monitor very early in the acquisition cycle who will ultimately become the IOT&E or OT&E manager. This would motivate the user/tester to influence the design while still in a flexible state.

A LOOK INTO THE EFFECTIVENESS
OF TAC IOT&E
STUDY REPORT

Presented to the Faculty
of the
Defense Systems Management School
in Partial Fulfillment of the
Program Management Course
Class 74-1

by

Thomas H. Julian
GS-13 DAFC

May 1974

This study represents the views, conclusions, and recommendations of the author and does not necessarily reflect the official opinion of the Defense Systems Management School nor the Department of Defense.

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First, I wish to express my appreciation to the interviewees, who provided me with many thoughts and with excellent background information on recent Air Force policy changes. The interviewees were:

Colonel R. W. Phillips, Deputy Director for Operational
Test and Evaluation, DCS/Plans and Operations,
Headquarters, US Air Force

Lieutenant Colonel A. W. McRae, Aircraft and Equipment
Test Division, Deputy Director for Operational Test
and Evaluation, Headquarters, US Air Force

Mr. H. A. Beck, Test Analysis and Evaluation Division,
Deputy Director for Operational Test and Evaluation,
Headquarters, US Air Force

I would also like to express my appreciation to Major Lee S. Jackson, US Air Force, Management Research Officer, DSMS, for his much-needed constructive help in designing the questionnaires.

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A LOOK INTO THE EFFECTIVENESS OF TAC IOT&E

A. INTRODUCTION

1. Objective

The overall purpose of this effort was to provide the author some insight into the effectiveness of the Air Force's relatively new Initial Operational Test and Evaluation (IOT&E) procedures.

2. Scope

Past studies have adequately investigated the background and rationale leading up to the current Department of Defense (DOD) policies on IOT&E (1, 2, 3). These test philosophies originally instituted in 1970 by the then Deputy Secretary of Defense, Mr. David Packard, have been re-emphasized by their appearance in the Air Force Regulation 23-36, Air Force Test and Evaluation Center (AFTEC), 1 January 1974, and in the DOD Program of Research, Development, Test and Evaluation FY 75, April 1974, and by a recent April 1974 address by Deputy Secretary of Defense Clements to the Defense Systems Management School faculty and students (4, 5). Therefore, this report will not reiterate in detail these management philosophies, but instead, will introspect some of the implementation aspects of this policy as they apply specifically to Tactical Air Command (TAC) IOT&E. A comprehensive study which would include all known aspects relating to the effectiveness of operational testing would require resources far exceeding those available under the author's academic restraints. Therefore, I elected to investigate only aspects of TAC IOT&E testing which are conducted concurrently during Development Test and Evaluation (DT&E).

3. IOT&E Defined

IOT&E is that Operational Test and Evaluation conducted prior to a production decision. The intent of IOT&E is to determine factors such as operational effectiveness, suitability, and supportability as early in the systems acquisition cycle as possible (6:6). IOT&E is accomplished by supporting or operating commands and will be performed on pilot production items when available. In the case of major systems (i.e., those with development costs in excess of \$200 million), the IOT&E is required prior to the Defense Systems Acquisition Review Council action preceding the production decision (normally DSARC III). (7) IOT&E was instituted in 1971 by the then Deputy Secretary of Defense, Mr. David Packard. His memoranda of 11 February, 21 April, and 3 August 1971, which were later superseded by Department of Defense Directive 5000.3, "Test and Evaluation," 19 January 1973, all provided basic policies for IOT&E (8, 9, 10). The memoranda were results of Mr. Packard's own investigation into Test and Evaluation activities, results of the Blue Ribbon Defense Panel (BRDP), General Accounting Office reports, and criticism from Congress. Some of the primary criticisms and recommendations were:

- a. OT&E was poorly designed and executed and was generally inadequate.
- b. Recommended that DOD establish a Defense Test Agency and that the Joint Chiefs of Staff (JCS) perform joint operational testing.
- c. Recommended that the military Services conduct OT&E by an organization independent of the developer.

Following the BRDP report, Mr. Packard, in 1971, issued three memoranda on OT&E (8, 9, 10). They directed that:

a. OT&E be performed by an agency separate and distinct from the developer which evaluates and reports the test results directly to the Service Chief.

b. IOT&E be performed by operational personnel in as realistic an environment as possible prior to the production decision.

c. Each Service would establish a staff focal point for OT&E at the headquarters level.

4. Combined DT&E/IOT&E Defined:

DT&E/IOT&E denotes a testing concept whereby the IOT&E is conducted during the DT&E phase. This is normally accomplished when program schedules, costs, or production lead time do not permit independent testing by the Operating and Supporting Commands. Although the system is under the overall control of the Systems Command, the Operating Command (user) conducts a separate, independent evaluation. The results of this IOT&E are forwarded through separate reporting channels to HQ, USAF. (6)

5. Limitations:

This report addresses only those IOT&E programs conducted concurrently during the Air Force Systems Command's (AFSC) development test and evaluation effort. This was done since by far the largest majority of all current IOT&E testing falls within this category. It is further restricted to only joint Development Test and Evaluation (DT&E)/IOT&E programs involving the AFSC and the TAC, respectively. The rigid academic schedule imposed upon the author limited the scope of this effort to investigating only the effectiveness of recent combined TAC IOT&E. Also, only those TAC IOT&E tests conducted prior to completion of full-scale

development are considered (i.e., combined DT&E/IOT&E). No attempt was made to collect information on any specific size or dollar value program. Therefore, most of the information in this report reflects views concerning programs with a dollar value less than major.

6. Organization of Report:

Paragraph B provides information on the methods used in data collection. It also includes a general description of the analysis made and references to the appropriate annexes for details. Paragraph C discusses the results from both interviews and questionnaires. The statistical results are discussed in some detail. Paragraph D provides background and mission information on the latest OT&E reorganization in the Air Force. Paragraph E provides conclusions and recommendations resulting from this study.

B. DATA COLLECTION AND METHOD OF ANALYSIS

1. General:

Data for this report was collected through personal interviews and questionnaires. The questionnaires were used to provide program manager level opinions on combined DT&E/IOT&E testing. Two slightly different questionnaires were used. One was tailored for the AFSC DT&E program managers, and one for the TAC IOT&E project managers. The majority of TAC's IOT&E is conducted by project managers in the Tactical Air Warfare Center (TAWC). Therefore, for TAC information, questionnaires were mailed to TAWC. When TAWC is mentioned from time to time in this report, it should be remembered that this is TAC's prime OT&E test agency.

2. Report Review:

Initially, one intent was to review specific recent IOT&E reports through an analysis of their conclusions and recommendations and subsequent determination of HQ, USAF actions resulting from these reports. This summarization was intended to indicate to what degree TAC IOT&E recommendations and conclusions were being followed. The rationale was that this would provide an indication of the credibility of the reports as viewed by higher headquarters and in turn demonstrate some measure of IOT&E effectiveness. It was decided that all TAC joint DT&E/IOT&E reports published during the calendar year 1973 would be used. A listing was made and included the TAWC IOT&E reports listed in Table 1.

My efforts to accomplish the report summation task were beset with problems from the very beginning. A delay in obtaining some report copies was experienced due to classification and several were never received. Further, the recommendations and conclusions varied widely in content and

TABLE 1
Recent TAWC IOT&E Reports

<u>TITLE</u>	<u>TEST NO.</u>	<u>DATE PUBLISHED</u>
Compass Robin	73C-010U	NOV 1973
IR Proximity Fuse	73C-018T	AUG 1973
TAC IOT&E of Internodel Modular Container	73C-024T	SEP 1973
Airborne Warning and Control System (AWACS) Phase I	73C-045T	JUL 1973
Evaluation of AN/PPS-15 Surveillance Radar	73C-051T	SEP 1973
Improved ADAS, AN/ASQ-154 (XA-2)	73C-083T	SEP 1973
IOT&E of Tactical Air Cargo Loader	72C-014	AUG 1973
Constant Cone AIM 7F OPEVAL	72C-044	MAR 1973
IOT&E of AN/PRC-104 HF/SSB Manpack Radio	72C-084	JAN 1973
TAC High Line Dock	72C-130T	JUN 1973
TAC Information Processing and Interpretation Segment	72C-137T	AUG 1973

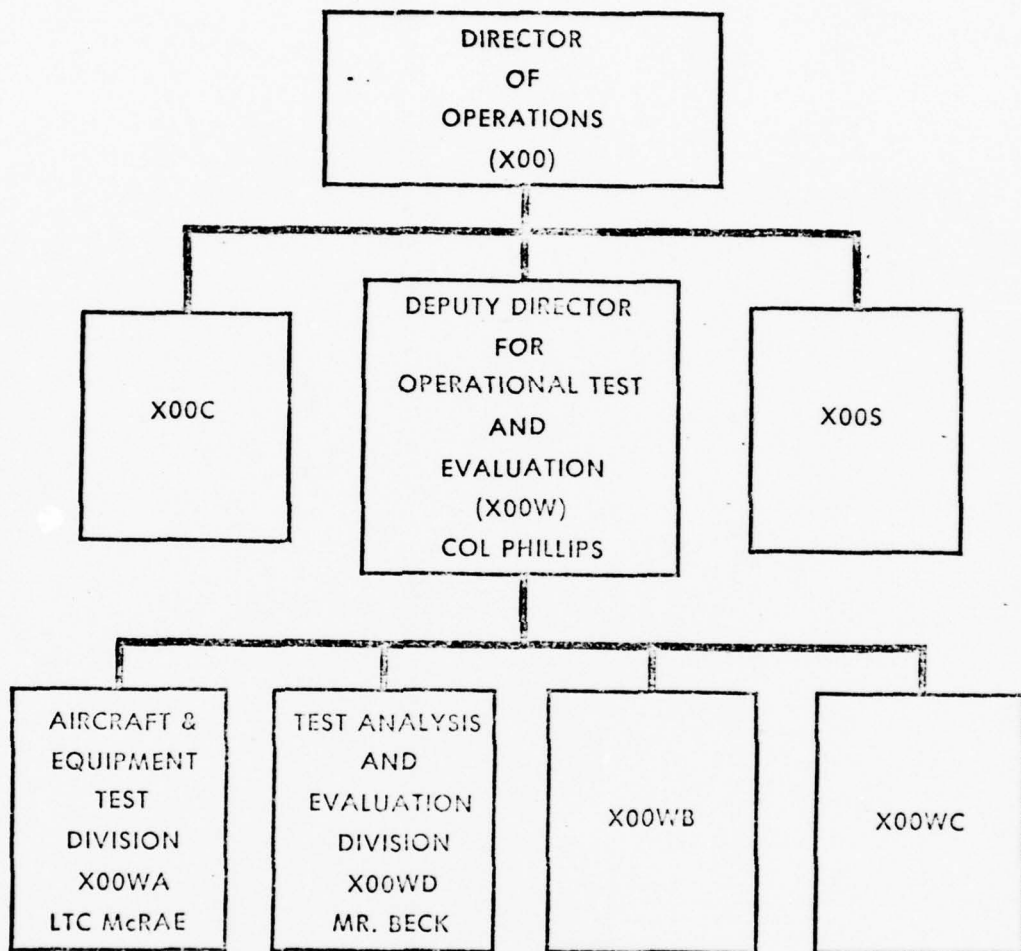
quantity with many being extensive and detailed. For example, one report contained fourteen recommendations and thirteen conclusions. It became apparent that this effort would be both difficult and time-consuming, and in addition, would have produced results which possibly could be obtained through personal interviews in a much shorter time period. Therefore, the report review was abandoned.

3. Interviews:

Interviews were conducted with Headquarters, United States Air Force (HQ, USAF) personnel in the Directorate of Operations; specifically, Colonel R. W. Phillips, Deputy Director for Operational Test and Evaluation, and two other personnel in his division were interviewed. These were Lieutenant Colonel A. W. McRae, Aircraft and Equipment Test Division, and Mr. H. A. Beck, Test Analysis and Evaluation Division. See Organizational Chart (Figure 1).

As mentioned earlier, no distinction was made in this report between major and minor programs, and since by far the majority fall within the latter category, this led me to Colonel Phillips. Had I been concerned primarily with major programs and policy implementation, it would have undoubtedly been beneficial to interview the Deputy Director of Test and Evaluation (Lieutenant General Starbird, USA, Ret) within the Office of the Deputy Director of Research and Engineering (DDR&E), or some of his staff. However, I found Colonel Phillips and his staff to be very well informed on the latest TAC IOT&E programs and so cooperative in answering my questions that I felt it unnecessary to pursue the personal interviews further. The following general questions are of the type posed to Colonel Phillips and his staff:

- a. Will you describe your organization and its responsibilities as related to Air Force IOT&E?
- b. Specifically, how do you use the results of a typical TAC IOT&E report?
- c. How would you rate the quality and substance of recent TAC IOT&E reports insofar as their content of information needed in the program decision process?
- d. Can you describe the recent Air Force OT&E reorganization and the rationale for making the change?



ORGANIZATIONAL CHART

Figure 1

4. Questionnaires:

Questionnaires were mailed to both AFSC DT&E program managers and TAWC IOT&E project managers. Twenty-one questionnaires were mailed to AFSC program managers within the following listed Aeronautical Systems Division (ASD) offices, Wright-Patterson AFB, Ohio:

RWD
RWR
RWE
RWZ
RWS
RW86
RD4T
SDUP
SD5T

Twenty-one slightly different questionnaires were mailed to TAC IOT&E project managers in the TAWC, Eglin AFB, Florida. These questionnaires were mailed to personnel in the following listed TAWC offices, all of which are organizationally under the Deputy for Test and Evaluation:

Directorate of Reconnaissance (also includes TAC drone testing)	TER
Directorate of Electronic Warfare	TEW
Directorate of Fighter Test & Evaluation	TEF
Directorate of Command & Control	TEO
Directorate of Airlift & Support Opns	TEL

An example of each questionnaire type is included as an annex to this report. (See Annex A for AFSC questionnaire, and Annex B for TAWC questionnaire.)

5. Data Analysis:

All information collected for this report reflects the opinions and judgments of individuals. The manner in which it is presented is the personal preference of the author resulting from his particular background and experience. Specific information collected during the personal interviews was recorded through conventional note-taking techniques. The questionnaires were designed to avoid, wherever possible, simple yes/no answers by providing individuals a range within which to express their opinions. They were also given an opportunity to comment on each question if they so desired. Fifteen of the 21 questionnaires mailed to AFSC were returned, while 17 of the 21 sent to TAWC were returned. This provided an overall response of 76 percent. For data analysis and clarification, questions common to both AFSC and TAWC questionnaires are grouped with responses and comments from each source. Questions pertaining to only one questionnaire type are each listed separately with corresponding responses and comments (see Annex C). Responses are plotted as bar-graphs to facilitate understanding and to indicate trends.

Statistics were applied to responses from each question to determine if a group opinion for that question was actually exhibited. Due to the relatively small sample size, the method used was the Kolmogorov-Smirnov one-sample test (11:300). Once it was established that a group opinion for a specific question did exist, the mean of the responses from the AFSC group was compared to the mean of the responses from the TAWC group to determine if any significant differences existed (12:233). For the reader who desires to follow the method of calculation, an example of each

type is included in Annex D. Each questionnaire contained several questions designed to indicate only whether or not the respondent had the qualifications or experience desired for answering the scaled questions. The qualification questions were not of any other value and are summarized in Annex C only for completeness.

C. RESULTS AND DISCUSSION

1. Purpose:

This section includes the analysis of all information collected during this effort. I have attempted to keep the results as objective as possible, and therefore relied quite heavily on statistical analysis of group sample responses.

2. Interviews:

Prior to initiating this investigation of combined DT&E/IOT&E, I must admit that some suspicions were present within my mind that all was not working out as well as had been originally intended. I wanted to determine where the major criticisms, if any, would lead me. I felt that this could be best approached through interviews with the proper people in HQ, USAF. First, I desired general comments or feelings on the adequacy of TAWC in performing its role as TAC's primary test organization for OT&E. I intentionally narrowed this down to efforts of combined DT&E/IOT&E, since by far the largest percentage of tests now fall in this category. These objectives led me to Colonel Phillips in HQ, USAF/XOOW. Comments from Colonel Phillips and his staff were most encouraging. It was learned that almost without exception, the IOT&E performed by TAWC was adequate to enable any necessary HQ, USAF program decisions.

The recent creation of the Air Force Test and Evaluation Center (AFTEC) in January 1974 raised some questions as to the background leading up to this decision. I especially wanted to determine if any past problems with IOT&E in TAWC had any tie-in with the establishment of the new test center. Mr. H. A. Beck of Colonel Phillips' staff had extensive

experience in helping to organize and establish AFTEC. My discussions with Mr. Beck were most helpful, as they provided me with some detailed information on the background and operation of AFTEC which I had not previously been privileged to receive. It was confirmed that AFTEC establishment had no relationship to recent TAC IOT&E performance. Background information leading up to establishment of AFTEC and a brief description of its mission are included in Section D.

3. Questionnaires:

The opinions expressed by Colonel Phillips and his staff on the excellent quality and effectiveness of TAC IOT&E are substantiated by data received through the questionnaires. It is interesting to note that of the seven questions common to both AFSC and TAWC questionnaires, only three fell into the category possessing group opinions from both sources. Two of these questions were related to the effectiveness of TAC IOT&E. The first set of questions requested an opinion on the degree to which the IOT&E recommendations have been or will be followed. The arithmetical mean of the responses to these questions in each case favored a positive response. The first question means were each halfway between "moderate value" and "great value" on the scale. A statistical test at the 95 percent confidence level demonstrated no significant difference between the two sample means. The second question, which addressed "the degree IOT&E recommendations are followed," provided very similar results with no significant differences in the means observed. The sample response means were again approximately halfway between "moderately" and "greatly." A look at the remaining questions and their responses reveals only "good" or positive

opinion trends on all responses that indicated a group opinion (see Table 2). This holds true even when considering only an 80 percent confidence level for a group opinion. The 80 percent confidence level was also checked, since many responses indicated no opinion at the 90 percent confidence level. In presenting this type data, I realize some of the potential shortcomings, since the sample size is small, and the different question interpretation by each individual submitting an opinion. The response to one question in particular leads me to believe the two groups interpreted it differently. This was the question concerning the "opportunity to comment on IOT&E test objectives before they are formalized." "Formalized" to the IOT&E project manager means before they appear in a TAC-approved test order document. "Formalized" to the AFSC project manager could have meant appearance in the IOT&E test plan which follows the test order. From past experience, I know that the detailed test plan is coordinated much more intensively with the responsible DT&E project manager than the TAC project order which lists the project objectives and provides TAWC with the authority to proceed with the evaluation. This explanation is reinforced somewhat by the AFSC project managers' responses to the question dealing with the extent of IOT&E project manager coordination with DT&E project manager during IOT&E planning (AFSC Question #13). An AFSC group opinion did exist with an 80 percent confidence level. The fact that no TAWC opinion existed indicates that the group could not agree that they had adequate opportunity to comment on IOT&E test objectives prior to their issuance by higher headquarters. This does not take advantage of experienced IOT&E project managers' expertise and does not appear to be

an optimal approach for achieving workable test objectives. Workable test objectives are extremely important, since the entire effort must be structured around these points.

Since no real controversy was revealed from the questionnaire responses, there is no point in continuing a lengthy discussion. The statistical analysis results are summarized in Table 2. The questions were also categorized according to question type with a brief summation of respondents' reactions to the questions. This is included as Table 3. Again, it can be seen that the overwhelming positive group opinions established were toward those questions relating specifically to the quality of IOT&E.

Table 2

TABLE 2

QUESTION NO. AFSC T/M/C	QUESTION	GROUP OPINION (90% Confidence Level)				GROUP OPINION (90% Confidence Level)				ARE SAMPLE MEANS SIGNIFICANTLY DIFFERENT? (95% Confidence)		OPINION TREND (Positive Denotes Good)	
		AFSC	YES	NO	T/M/C	AFSC	YES	NO	T/M/C	YES	NO	AFSC	T/M/C
5	10TME Value to Air Force		X				X				X	Positive	Positive
6	Opportunity to Comment on Test Objectives		X				X				X	Positive	No opinion
11	Work relationship with Other Personnel		X				X				X	Positive	No opinion
15	Duplication of Other Reports		X				X				X	No opinion	Positive
17	Logistic Support adequacy		X				X				X	No opinion	No opinion
19	Report was situation followed		X				X				X	Positive	Positive
22	10TME Authority Adequate		X				X				X	Positive	Positive
7	10TME Plan Allow for 10TME		X				X				X	No opinion	N/A
9	10TME Objectives Affected by 10TME		X				X				X	No opinion	N/A
10	10TME Objective Affected by 10TME		X				X				X	Positive	N/A
13	10TME to Coordinate with AFSC during Test Planning		X				X				X	Positive	N/A
14	10TME to Coordinate with AFSC on 10TME Report		X				X				X	No opinion	N/A
16	10TME Recommendations Good		X				X				X	Positive	N/A
8	Overall 10TME Objectives OK for "No" Decision		X				X				X	N/A	Positive
9	Adequacy of 10TME Objectives		X				X				X	N/A	Positive
10	Time Available for 10TME Planning		X				X				X	N/A	No opinion
11	Adequate 10TME Data Collected		X				X				X	N/A	Positive
13	10TME Test Environment		X				X				X	N/A	No opinion
17	Political or Other Factors Affect Objectives		X				X				X	N/A	Positive
19	Cost Impact District		X				X				X	N/A	Positive
21	Time to Write Report Adequate		X				X				X	N/A	No opinion
12	Independent Test Desired												

*This question was not scaled and could only be answered "yes" or "no." Results were:

AFSC	YES	NO
	7%	93%

T/M/C	YES	NO
	66%	34%

Table 3
Summary of Reactions

<u>QUESTION TYPE</u>	<u>GENERAL REACTIONS</u>
<u>Quality of IOT&E (General)</u> AFSC Questions 5, 15, 16, 18 TAWC Questions 5, 8, 9, 11, 16, 20	Only one group response to these questions possessed no group opinion. This was TAWC's response to the question on duplication of other reports (No. 16). All other responses indicated definite opinions. These opinions were all positive.
<u>Coordination</u> AFSC Questions 8, 13, 14 TAWC Question 7	AFSC had positive group opinions on two of the three questions relating to coordination. TAWC had none on their one question which related to the test objectives which, in my opinion, appears to be a significant issue.
<u>Working Relationship with Other Program Managers</u> AFSC Question 11 TAWC Question 13	Again, AFSC program managers had a definite group response, indicating a favorable working relationship--TAWC program managers had no group opinion.
<u>Authority of IOT&E Program Managers</u> AFSC Question 19 TAWC Question 20	There was general positive agreement between both groups on this point. Apparently, no problem exists here.
<u>Realistic Test Environment</u> TAWC Question 15	No group opinion existed as to the realism of test environment.
<u>Logistics Considerations in IOT&E</u> AFSC Question 17 TAWC Question 19	No group opinion existed for either TAWC or AFSC.
<u>Cost Factors</u> TAWC Question 18	The definite group opinion here was that cost caused no problems with the IOT&E.
<u>Adequacy of Time Allowed for IOT&E Plan and Report</u> TAWC Questions 10, 21	No group opinion exhibited.
<u>IOT&E Effects on DT&E</u> AFSC Questions 7, 9, 10	Only one group opinion existed here. It established that no DT&E schedule degradation was experienced as a result of the IOT&E.

D. AIR FORCE TEST & EVALUATION CENTER (AFTEC)

After the issuance of Mr. Packard's memoranda in 1971 and the resulting Air Force's restructuring of its OT&E policies, some criticism of its OT&E activities continued. The December 1972 Report of the Commission on Government Procurement states:

To be independent and impartial, OT&E components should be distinctly separate from the organizations that sponsor or will use a major system.

The developmental activity should not be the evaluator of his own product It is very difficult for those responsible for developing a system to remain objective about it. Therefore, the test data, evaluation, and reporting must be credible and come from a separate source.

There are several reasons why the user should not have primary responsibility for operational testing. The user is directly involved on the evaluation of and requirement for the system and usually applies pressure to have the system deployed as soon as possible. The user has many overriding demands on its own resources that are concerned with its primary missions. Operational testing should receive emphasis and become a professional career activity in the agency. A high level of training is required and the personnel assigned should have scientific, operational, and analytic skills. During the past decade, only the Air Force has assigned operational testing to the user.

The organizational arrangement that best satisfies the two needs described above would be the one similar to the Navy: a separate activity reporting to a high level. The Army recently established a separate activity to perform OT&E. (13:164)

In addition, a Comptroller General Report of March 26, 1973, recommended:

Continue to emphasize operational test and evaluation by establishing in each military department an organization independent of the developer and user. The senior OSD official in this activity should report to the Secretary of Defense or to his Deputy. (14:54)

In essence, the Air Force has been the only remaining Service to not establish an independent test and evaluation organization. This situation

has now been changed, since Air Force Regulation 23-36, issued in January 1974, established the Air Force Test and Evaluation Center (AFTEC) as a separate operating agency. The mission of AFTEC is defined in the regulation as follows:

AFTEC's mission is to manage the Air Force's Operational Test & Evaluation program. AFTEC assesses the military utility of major and HQ USAF designated non-major Air Force systems. Major commands (MAJCOMS) support AFTEC as directed by HQ USAF program management directives (PMDs) or Test Directives (TDs). AFTEC recommends Air Force OT&E policy to HQ USAF for approval as well as plans, directs, controls, evaluates and reports--independently--on OT&E. AFTEC serves as the principal field command for providing OT&E information to the Secretary of the Air Force (SAF) and the Chief of Staff of the Air Force (CSAF) in preparation for DSARC actions and procurement requests for which OT&E information is statutorily required to be supplied to the Congress.

This regulation goes on to define other mission policies, such as:

HQ USAF designates OT&E projects that AFTEC will conduct as well as some that MAJCOMS will conduct. Other OT&E projects may be conducted by MAJCOMS when directed by their respective commanders. (4:1)

In other words, AFTEC will be primarily responsible for OT&E of major systems with major command OT&E continuing much the way it is now. It is envisioned that TAC's testing center, the Tactical Air Warfare Center (TAWC), will continue its functions of OT&E in support of both HQ USAF and TAC-directed OT&E. For further clarification, HQ USAF Program Management Directive (PMD) 74-1 categorizes OT&E into four groups and lists responsibility as follows: (15)

AFTEC-CONDUCTED OT&E PROJECTS

<u>AF/XOOW</u>	<u>AFTEC</u>	<u>COMMANDS</u>
Draft PMD (Critical Issues)	OT&E Input (Test Schedule) (Resource Estimate)	
Final PMD (Initial Test Directive)	Draft Test Design	Inputs Project Order
	Final Test Design	Comments
	Form Test Team Preliminary Test Plan	Coordinate
Obtain Air Staff Approval	Draft Test Plan AFTEC/CC Estimate Draft Test Directive	Info
Final Test Directive	Final Test Plan	Project Plan
Info	Interim Test Reports	Info
Follow-up	Final Test Report AFTEC/CC Summary Follow-up	Follow-up

AFTEC-CONDUCTED JOINT OT&E PROJECTS

<u>DDR&E</u>	<u>AF/XOOW</u>	<u>AFTEC</u>	<u>COMMANDS</u>
Memo	Initial Test Directive		Project Order
	Obtain Air Staff Approval	Designate Test Director	
Approve	Negotiate Charter	Info Form Test Team	Info Manning
Test Design	Obtain Approval	Negotiate	Comment
Approve	Obtain Approval	Draft Test Plan AFTEC/CC Estimate Draft Test Directive	Coordinate
	Final Test Directive	Final Test Plan	Project Plan

COMMAND-CONDUCTED OT&E PROJECTS

<u>AF/XOOW</u>	<u>AFTEC</u>	<u>COMMAND</u>
Draft PMD (Critical Issues)	Input (Test Schedule) (Resource Estimate)	
Final PMD (Final Test Directive)	Info Approval	Project Order Test Design/ Test Plan
Info	Monitor	Interim Test Reports
Follow-up	Evaluate AFTEC/CC Summary Follow-up	Final Report Follow-up

COMMAND-INITIATED OT&E PROJECTS

<u>AF/XOOW</u>	<u>AFTEC</u>	<u>COMMANDS</u>
	Info	Project Order Test Plan Project Plan
	Info	Interim Test Reports
	Info	Final Report Follow-up

While the rationale for creating AFTEC is quite clear, the reasoning which allows continued MAJCOM (User) IOT&E is not. The same rationale that applies to major systems appears to also apply equally to the others.

E. CONCLUSIONS AND RECOMMENDATIONS

1. Conclusions:

Mr. David Packard's revisions of test and evaluation policies in 1971 have had far-reaching effects on the Air Force's test philosophy. This has affected the test concept for all subsystems, whether they are categorized as major or not. It is refreshing to note that many Systems Command program managers recognize the importance of user involvement early in the system acquisition phase. The two-way exchange between AFSC and TAWC as afforded by combined DT&E/IOT&E appears to have been widely accepted. This improved communication link will no doubt reap immeasurable benefits.

It is also concluded that TAC/TAWC IOT&E performance has been excellent. No negative comments were received during the course of interviews, although I made several attempts to ferret some out. A few negative comments were recorded on the questionnaires, but these were minor and were not indicative of any perceivable trend. Statistical data analysis revealed only the existence of positive opinions from each sample group.

2. Recommendations:

The objectives of the developer and user/tester are usually quite different. Therefore, I recommend more emphasis be placed on combined DT&E/IOT&E testing in order to resolve earlier the differences between the developer and user. I believe this should be done whenever possible and not be reserved only for situations where it must be warranted by program schedules or fund limitations as implied by AFR 80-14. I also recommend that for every acquisition program, AFTEC or the using command (whichever is

appropriate) designate an individual from the OT&E testing organization to maintain close liaison with the developer. This individual should be designated at the earliest possible date, and, if possible, should be the prospective IOT&E or OT&E project manager. This early participation is in consonance with current DOD policies and would motivate the user/tester to influence the design while it is in a flexible state.

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6. Department of the Air Force Regulation 80-14, Test and Evaluation, 12 May 1972.
7. US Department of Defense Directive 5000.3, Test and Evaluation, 19 January 1973.
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9. Deputy Secretary of Defense Memorandum, Incorporation of Test and Evaluation into the Development Concept System, 21 April 1971.
10. Deputy Secretary of Defense Memorandum, Test and Evaluation in System Acquisition Process, 3 August 1971.
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12. Mendenhall, William, Introduction to Probability and Statistics. 3rd ed. Wadsworth Publishing Company, 1971, pp. 233-234.
13. Report of the Commission on Government Procurement, Volume 2, December 1972.
14. Comptroller General Report to the Committee on Armed Services House of Representatives, Cost Growth in Major Weapon Systems, 26 March 1973.

ANNEX A

SAMPLE QUESTIONNAIRE AND COVER LETTER
OF THE TYPE MAILED TO
AFSC PROGRAM MANAGERS



DEPARTMENT OF DEFENSE
DEFENSE SYSTEMS MANAGEMENT SCHOOL
FORT BELVOIR, VIRGINIA 22060

DSMS-PMC

SUBJECT: Student Study Paper Questionnaire

1. My name is Tom Julian and I am currently a student at the Defense Systems Management School (DSMS), Fort Belvoir, Virginia. One of the academic requirements of the School is the completion of a study paper relating to a management topic.
2. The purpose of the attached questionnaire is to collect data for the study paper, which will be titled "A Look into the Effectiveness of TAC IOT&E". One purpose of the study is to gain some insight into how well the relatively new concept of combined DT&E/IOT&E is working out. The questionnaire is intended for a program manager who has actual experience in conducting the DT&E portion of a combined DT&E/IOT&E. There are no right answers for the questionnaire. I am soliciting your opinions and any comments you would like to make. Anonymity of the questionnaire will be maintained.
3. I am under a very tight academic schedule, so a rapid response would be appreciated. Request return of the questionnaire by 19 April 1974.
4. If any questions arise concerning this questionnaire or if discussion is desired, I can be reached at the DSMS, AUTOVON: 354-5536.
5. Any assistance you or any of your associates can provide will be greatly appreciated.

1 Inclosure
Questionnaire

THOMAS H. JULIAN, DAFC
Program Management Course 74-1

QUESTIONNAIRE

NOTE: If you have had management experience on more than one combined DT&E/IOT&E, please base your opinions on the last one completed. Answers to the scaled questions should be indicated by a mark within one of the five spaces provided.

1. How did you initially become familiar with the general intent of IOT&E as defined in DOD Directive 5000.1 or AFR 80-14? (Check one answer.)

- ☐ a. OJT/conversation with fellow workers.
- ☐ b. Command information/correspondence.
- ☐ c. Read regulations/directives.
- ☐ d. Briefed by supervisor.
- ☐ e. Other (please specify). _____

2. How many joint DT&E/IOT&E programs have you been associated with? _____

3. How many have you managed to completion? _____

4. During what calendar year was your last test completed? _____

5. In your opinion, how valuable was the IOT&E portion to the best interests of the Air Force?

NO VALUE		MODERATE VALUE		GREAT VALUE

Comments: _____

6. In which of the following categories would you classify the test item at the time of IOT&E? (Check one answer.)

- ☐ a. Pre-production prototype.
- ☐ b. Pilot production item.
- ☐ c. Breadboard construction.
- ☐ d. Commercial off-the-shelf.
- ☐ e. Other (describe). _____

7. To what degree did you allow for IOT&E during the DT&E planning?

NONE		MODERATELY		GREATLY

Comments: _____

8. How much opportunity did you have to comment on proposed IOT&E test objectives before they were formalized?

NONE		MODERATE		GREAT

Comments: _____

9. To what degree do you feel that accomplishment of DT&E test objectives was effected by using command participation?

NONE		MODERATE		GREAT

Comments: _____

10. In your opinion, to what degree was your test completion schedule adversely affected by the inclusion of IOT&E?

NONE		MODERATE		GREAT

Comments: _____

11. How would you rate your working relationship with the IOT&E project manager?

POOR		AVERAGE		EXCELLENT

Comments: _____

12. Would you have preferred to conduct your test independently, without using command involvement?

 a. YES

 b. NO

Comments: _____

13. To what degree did the using command coordinate with you during test planning?

NONE		MODERATELY		GREATLY

Comments: _____

14. To what degree did the using command coordinate with you during preparation of their test report?

NONE		MODERATELY		GREATLY

Comments: _____

15. To what extent, in your opinion, did the IOT&E test report duplicate those of any other Service or agency?

NONE		MODERATELY		GREATLY

Comments: _____

16. In your opinion, how would you rate the IOT&E conclusions and recommendations?

COMPLETELY INADEQUATE			COMPLETELY ADEQUATE	

Comments: _____

17. In your opinion, how well did the IOT&E results identify logistic support requirements?

COMPLETELY INADEQUATELY			COMPLETELY ADEQUATELY	

Comments: _____

18. To what degree do you think the IOT&E recommendations will be or have been followed?

NONE	MODERATELY			GREATLY

Comments: _____

19. How would you rate the adequacy of the IOT&E manager's authority to conduct his portion of the evaluation?

COMPLETELY INADEQUATE			COMPLETELY ADEQUATE	

Comments: _____

20. Any additional comments may be included in the space below.

ANNEX B

SAMPLE QUESTIONNAIRE AND COVER LETTER
OF THE TYPE MAILED TO
TAWC IOT&E PROJECT MANAGERS



DEPARTMENT OF DEFENSE
DEFENSE SYSTEMS MANAGEMENT SCHOOL
FORT BELVOIR, VIRGINIA 22060

DSMS-PMC

SUBJECT: Student Study Paper Questionnaire

1. My name is Tom Julian and I am currently a student at the Defense Systems Management School (DSMS), Fort Belvoir, Virginia. One of the academic requirements of the School is the completion of a study paper relating to a management topic.
2. The purpose of the attached questionnaire is to collect data for the study paper, which will be titled "A Look into the Effectiveness of TAC IOT&E". One purpose of the study is to gain some insight into how well the relatively new concept of combined DT&E/IOT&E is working out. The questionnaire is intended for a project manager who has actual experience in conducting the IOT&E portion of a combined DT&E/IOT&E. There are no right answers for the questionnaire. I am soliciting your opinions and any comments you would like to make. Anonymity of the questionnaire will be maintained.
3. I am under a very tight academic schedule, so a rapid response would be appreciated. Request return of the questionnaire by 19 April 1974.
4. If any questions arise concerning this questionnaire or if discussion is desired, I can be reached at the DSMS, AUTOVON: 354-5536.
5. Any assistance you or any of your associates can provide will be greatly appreciated.

1 Inclosure
Questionnaire

THOMAS H. JULIAN, DAFC
Program Management Course 74-1

QUESTIONNAIRE

NOTE: If you have had management experience on more than one combined DT&E/IOT&E, please base your opinions on the last one completed. Answers to the scaled questions should be indicated by a mark within one of the five spaces provided.

1. How did you initially become familiar with the general intent of IOT&E as defined in DOD Directive 5000.1 or AFR 80-14? (Check one answer.)

a. OJT/conversation with fellow workers.

b. Command information/correspondence.

c. Read regulations/directives.

d. Briefed by supervisor.

e. Other (please specify).

2. How many joint DT&E/IOT&E programs have you been associated with? _____

3. How many have you managed to completion?

4. During what calendar year was your last test completed?

5. In your opinion, how valuable was the IOT&E portion to the best interests of the Air Force?

NO VALUE		MODERATE VALUE		GREAT VALUE

Comments:

6. In which of the following categories would you classify the test item at the time of IOT&E? (Check one answer.)

a. Pre-production prototype.

b. Pilot production item.

c. Breadboard construction.

d. Commercial off-the-shelf.

e. Other (describe).

7. How much opportunity did you have to comment on proposed IOT&E test objectives before they were formalized?

NONE		MODERATE		GREAT

Comments: _____

8. In your opinion, how would you compare your particular overall test purpose with one which had been designed to facilitate a major program decision?

NO COMPARISON		MODERATE COMPARISON		IDENTICAL

Briefly describe the decision in your particular case. _____

9. In your opinion, to what degree were your test objectives adequate to enable a valid test and subsequent HQ decisions?

COMPLETELY INADEQUATE				COMPLETELY ADEQUATE

Comments: _____

10. How would you rate the time available to plan the test?

COMPLETELY INADEQUATE				COMPLETELY ADEQUATE

Comments: _____

11. To what extent were you able to collect adequate data to satisfy all test objectives?

COMPLETELY INADEQUATE				COMPLETELY ADEQUATE

Comments: _____

12. If your answer to the above question favored an inadequate rating (i.e., left of central point), to what would you attribute the major source of difficulty? (Check as many as appropriate.)

- ___ a. Insufficient time.
- ___ b. Poorly stated test objectives.
- ___ c. Inadequate test objectives.
- ___ d. Unrealistic planning.
- ___ e. Poor AFSC cooperation.
- ___ f. Priority.
- ___ g. Insufficient support.
- ___ h. Other (describe briefly). _____

13. How would you rate your working relationship with the AFSC program manager?

POOR		AVERAGE		EXCELLENT

Comments: _____

14. Would you have preferred to conduct this test as a separate IOT&E independent of AFSC?

- ___ a. YES
- ___ b. NO

Comments: _____

15. To what degree do you feel your test environment simulated an actual operational situation?

COMPLETE DISSIMILARITY				COMPLETE SIMILARITY

Comments: _____

16. To what extent, in your opinion, did your test report duplicate those of any other Service or agency?

NONE		MODERATE DUPLICATION		GREATLY

Comments: _____

17. In your opinion, to what degree were you restricted by political or other factors from making what you considered the most valid recommendations and conclusions?

NONE		MODERATELY RESTRICTED		GREATLY RESTRICTED

Comments: _____

18. To what degree did test cost factors restrict your evaluation?

NONE		MODERATE		GREAT

Comments: _____

19. In your opinion, how well did the IOT&E results identify logistic support requirements?

--	--	--	--	--

COMPLETELY INADEQUATE COMPLETELY ADEQUATE

Comments: _____

20. To what degree do you think your recommendations will be or have been followed?

--	--	--	--	--

NONE GREATLY

Comments: _____

21. How would you rate the adequacy of time allowed to properly write and publish the report?

--	--	--	--	--

COMPLETELY INADEQUATE COMPLETELY ADEQUATE

Comments: _____

22. In your opinion, how would you rate the adequacy of your authority during the evaluation?

--	--	--	--	--

COMPLETELY INADEQUATE COMPLETELY ADEQUATE

Comments: _____

23. Any additional comments may be included in the space below.

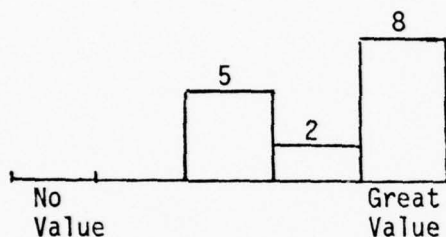
ANNEX C

This annex contains a complete listing of all scaled questions posed to the AFSC and TAWC program managers. These questions are grouped with the first ones being those common to both groups followed by only the questions addressed to AFSC and TAWC, in that order. The responses to each question are shown as bar-graphs. Included also is a summarization of all comments pertaining to the particular question. General comments not related to any one particular question are also categorized and included at the rear of this annex.

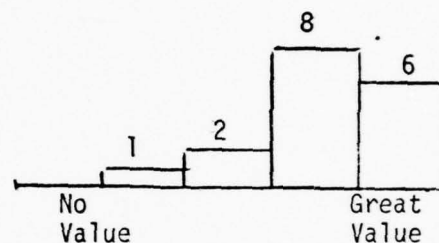
The following listed questions are those which were common to both the AFSC and TAWC questionnaires:

QUESTION: In your opinion, how valuable was the IOT&E portion to the best interests of the Air Force:

AFSC (Question #5)



TAWC (Question #5)



AFSC Comments:

The combined DT&E/IOT&E permits the user to make an assessment of the system earlier than the OT&E and gets the user on board the program early.

Speeds system development.

The system was so complicated that many problems remained, but TAC was able to determine basic usability anyway, and clear the flak.

It validated the operational capability of the equipment.

Reduces hassle with the user during OT&E deployment.

TAWC Comments:

IOT&E gives the operator a chance to get his views into final configuration.

I don't think the decisions made, based on the report, were proper.

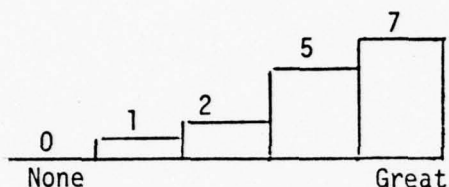
Several operational changes were incorporated prior to full-scale production as a result of the IOT&E.

The IOT&E was the DT&E; i.e., the DT&E folks used the IOT&E for data collection.

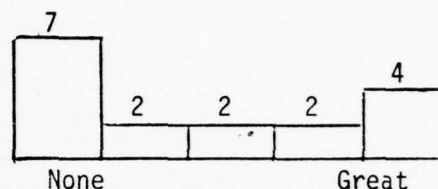
In many respects, the IOT&E also included gaps in the basic DT&E.

QUESTION: How much opportunity did you have to comment on proposed IOT&E test objectives before they were formalized?

AFSC (Question #8)



TAWC (Question #7)



AFSC Comments:

The IOT&E objectives were jointly developed and coordinated with AFSC/TAC.

IOT&E objectives are added after DT&E has been formalized.

Intercommand requirements and objectives were coordinated through the program.

We commented, but most objectives were ignored. Some were accepted.

Was responsible for the planning.

Test group established; plans started at the beginning of program.

TAWC Comments:

Would a new item perform in an acceptable manner and provide an improved capability over the present item?

Decision (apparently was made on emotional basis; not test results) was to discard equipment.

Operational suitability and effectiveness.

Had to meet DSARC IIA for additional pre-production missiles for continued test. US Navy presented the DSARC.

Data was available to make decision; however, I don't believe anybody used it.

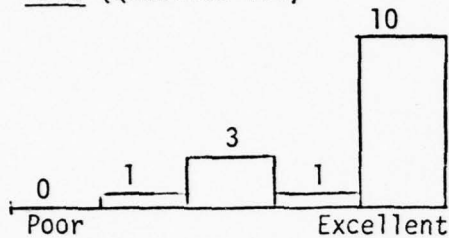
Qualification to two manufacturers' items for competitive bid purpose.

One test does not give me a basis to properly answer this.

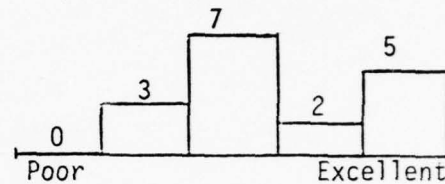
Fly-off between two systems for F-4 and/or Pylon carriage chaff/IR counter measures.

QUESTION: How would you rate your working relationship with the AFSC/TAWC program manager?

AFSC (Question #11)



TAWC (Question #13)



AFSC Comments:

Full-time user rep in SP0.

I was the IOT&E manager.

IOT&E project manager also served as one of the DT&E project test pilots.

I have been project manager of both the operational and the development side.

TAWC Comments:

Working relationships with the AFSC Test Engineer are generally better than with the AFSC Program Manager.

None on this test because we worked directly with the Navy.

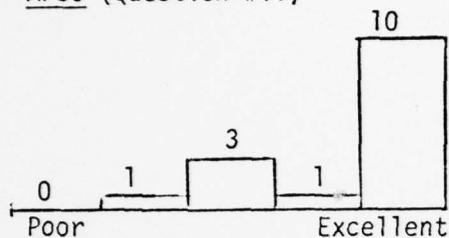
They tend to hide their dirty laundry.

Didn't work together.

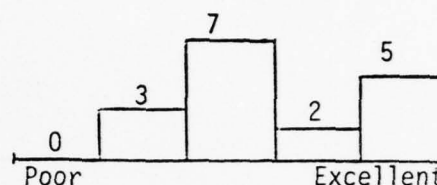
Working level good. Supervisory level is a problem. This may be unique to my situation at Eglin AFB, Florida.

QUESTION: How would you rate your working relationship with the AFSC/TAWC program manager?

AFSC (Question #11)



TAWC (Question #13)



AFSC Comments:

Full-time user rep in SP0.

I was the IOT&E manager.

IOT&E project manager also served as one of the DT&E project test pilots.

I have been project manager of both the operational and the development side.

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Working relationships with the AFSC Test Engineer are generally better than with the AFSC Program Manager.

None on this test because we worked directly with the Navy.

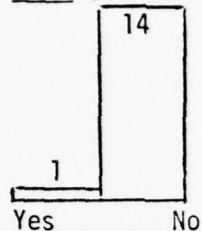
They tend to hide their dirty laundry.

Didn't work together.

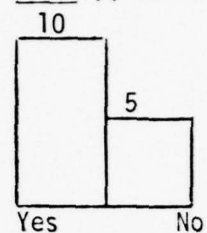
Working level good. Supervisory level is a problem. This may be unique to my situation at Eglin AFB, Florida.

QUESTION: Would you have preferred to conduct your test independently without the other command involvement?

AFSC (Question #12)



TAWC (Question #14)



AFSC Comments:

I strongly support early involvement of the using command in the test/evaluation of systems.

Having the operating command personnel on board at worse is an improvement.

By far better having him, if he's trying to help instead of pick.

The joint IOT&E resulted in expediting the achievement of development and operational objectives.

TAWC Comments:

Less harrassment.

Separate IOT&E with a decent hardware sample size to meet objectives.

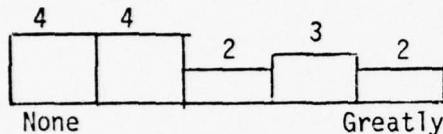
Engineering discrepancies were speedily resolved by AFSC allowing TAWC to handle only operational deficiencies.

His expertise was invaluable.

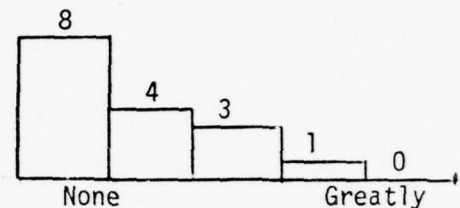
DT&E objectives are often counter-productive to IOT&E objectives and vice-versa. This produces conflicts over how limited assets are to be used and missions flown.

QUESTION: To what extent in your opinion did the IOT&E report duplicate those of any other Service or agency?

AFSC (Question #15)



TAWC (Question #16)



AFSC Comments:

The equipment tested was never tested by another Service or agency.

Not yet complete, but pretty independent, as planned.

The test report did overlap some DT&E test. However, it is extremely valuable to obtain the using command perspective and views regarding the test results. In particular, maintenance and operations evaluation was essential to convince CSAF to approve and fund the production modification which follows the DT&E/IOT&E.

80 percent of IOT&E duplicated the results of the DT&E report.

TAWC Comments:

The Navy has conducted similar tests.

Other agencies used my data to write their reports.

With only enough assets to adequately perform a DT&E, the report is very similar to a DT&E report.

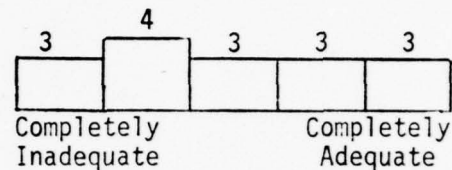
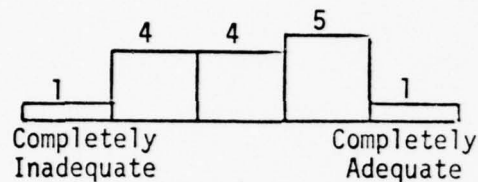
Some functional and maintainability objectives were duplicated.

None that I am aware of, although limited planning time makes detailed research difficult.

QUESTION: In your opinion, how well did the IOT&E results identify logistic support requirements?

AFSC (Question #17)

TAWC (Question #19)



AFSC Comments:

Too often the using command disregards development costs in order to get just what they want.

Original Maintenance Concept was modified.

Logistic support was not addressed since supportability of the major portion of the airborne equipment had already been determined.

This will continue to be an R&D program deficiency until sufficient R&D funds are provided to buy Blueline Tech Manuals very early in the program.

Built-in problem of the specific program. AGE is expensive, why build it unless this system is good, but how do you evaluate logistics without it?

TAWC Comments:

Not really included in test objectives.

Identification of logistics support requirements should not be a part of IOT&E, rather, they should be developed independently by AFLC.

Few tests are long enough to gather realistic logistic or maintenance data. Answers to these objectives are by necessity a whitewash.

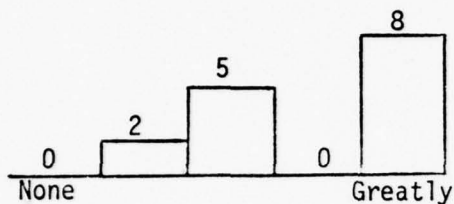
This was closely monitored.

This system was comparatively simple. Logistic support identification procedures are inadequate.

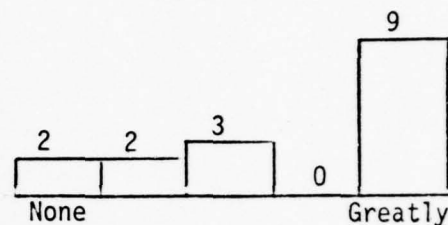
Relied on contractor for all logistic aspects.

QUESTION: To what degree to you think the IOT&E recommendations will be or have been followed?

AFSC (Question #18)



TAWC (Question #20)



AFSC Comments:

All recommendations have been acted on.

It appears that sufficient funds have been or will be made available to have at least 95% of user recommendations incorporated in production hardware.

An equipment production and Class V modification were approved as a result of the IOT&E.

TAWC Comments:

Final reports require too much coordination--everybody changes actual results to satisfy their own opinions.

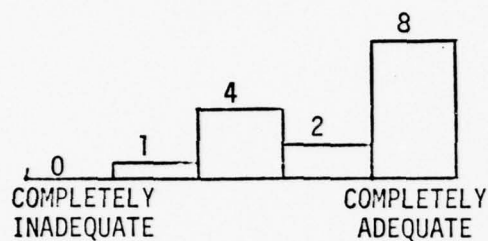
Bureaucracies are not immune to miracles.

Because of budgetary reasons and a change in requirements, a decision not to produce the hardware being tested was made prior to the end of the IOT&E.

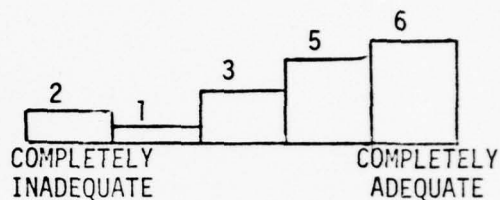
All recommended action is being acted upon.

QUESTION: How would you rate the adequacy of the IOT&E manager's authority during his portion of the evaluation?

AFSC (Question #19)



TAWC (Question #22)



AFSC Comments:

Can't make important decisions without high-level approval--especially in TAC.

IOT&E manager controlled total effort.

The only problem--in some cases IOT&E testing is put off until last and cut short.

TAWC Comments:

Some interference from superiors not completely familiar with the problems.

Be nice to everyone; after all, they are doing you a favor because this is by direction a non-interference test. And don't cry in public.

Project manager is a form pusher.

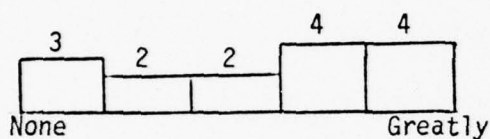
A better question would be, "How much have you damaged your career by making decisions which those higher up either disagreed with or felt were beyond your limits of authority?"

AFSC QUESTIONS

The following questions were included only in the questionnaire sent to AFSC program managers.

QUESTION: To what degree did you allow for IOT&E during the DT&E planning?

AFSC (Question #7)



AFSC Comments:

User involved since conceptual stage.

The program was a directed joint effort.

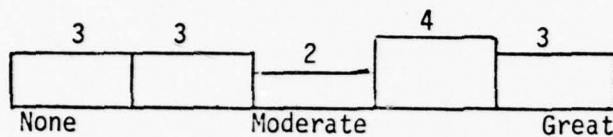
DT&E/IOT&E approach began with initiation of the program.

The operational command often is not ready for planning at the proper time.

The IOT&E was directed by CSAF/RDR after planning was completed for DT&E. The DT&E/IOT&E planning was later accomplished and the IOT&E objectives were developed and integrated into the test program.

QUESTION: To what degree do you feel that accomplishment of DT&E test objectives was effected by using command participation?

AFSC Response (Question #9)



AFSC Comments:

Favorably.

The joint effort eliminated problems that might have been otherwise generated.

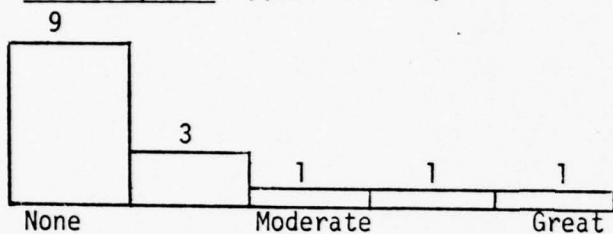
Mostly technical objectives in DT&E.

With qualified flight test aircrews rather than operational aircrews, greater system accuracies might have been achieved.

We established a TAC deputy test director and obtained outstanding support from the user.

QUESTION: In your opinion, to what degree was your test completion schedule adversely affected by the inclusion of IOT&E?

AFSC Response (Question #10)



AFSC Comments:

As a joint effort--IOT&E was scheduled along with the later phased DT&E.

Delayed the planning stage.

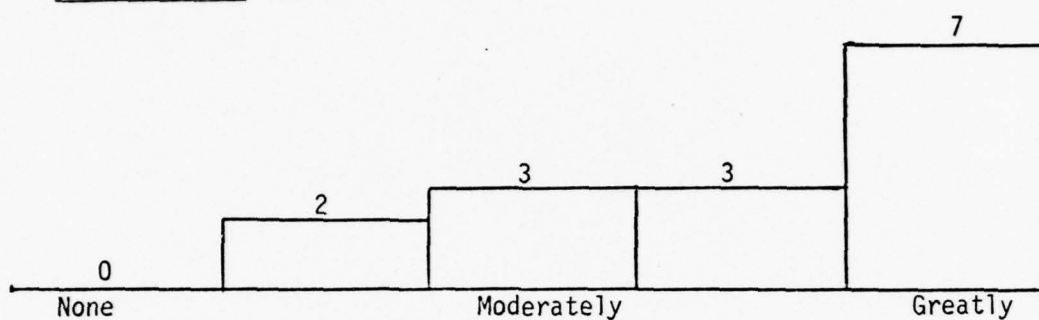
No effect on two-seaters. Only minor, about 10%-15%, on single-place aircraft.

The drive to ready the aircraft for IOT&E speeded DT&E somewhat.

Not affected since joint effort was planned at start of program.

QUESTION: To what degree did the using command coordinate with you during test planning?

AFSC Response (Question #13)



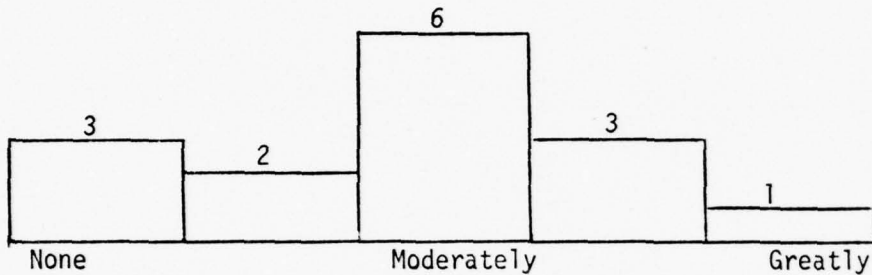
AFSC Comments:

Was directed joint effort.

Using command participated in test planning from onset of program.

QUESTION: To what degree did the using command coordinate with you during preparation of their test report?

AFSC Response (Question #14)



AFSC Comments:

Draft test report was supplied for info purposes.

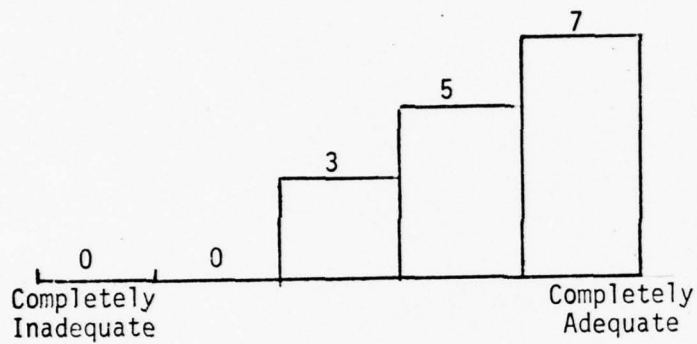
There is sometimes a feeling that the developing command wants to sway the IOT&E report.

We encouraged TAC to evaluate the system and prepare the final test report independently.

A post test meeting was held to review test and insure uniform interpretation of test data.

QUESTION: In your opinion, how would you rate the IOT&E conclusions and recommendations?

AFSC Response (Question #16)



AFSC Comments:

Funds shortage limited the IOT&E.

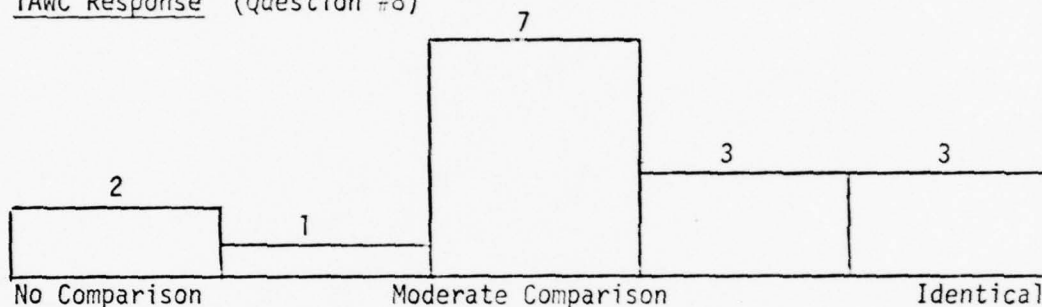
Premature, but probably completely adequate.

Reports of the operating and implementing commands were objective and generally in agreement.

The following questions were included only in the questionnaire sent to ICT&E project managers.

QUESTION: In your opinion, how would you compare your particular overall test purpose with one which had been designed to facilitate a major program decision?

TAWC Response (Question #8)



TAWC Comments:

Identify capabilities, limitations, deficiencies to facilitate development efforts.

Would a new item perform in an acceptable manner and provide an improved capability over the present item?

Decision (apparently was made on emotional basis; not test results) was to discard equipment.

Operational suitability and effectiveness.

Had to meet DSARC II for additional pre-production missiles for continued test. US Navy presented the DSARC.

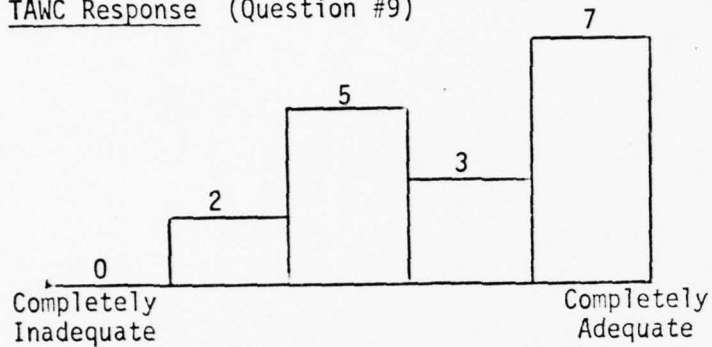
Qualification of two manufacturer's items for competitive bids purpose.

One test does not give me a basis to properly answer this.

Fly-off between two systems for F-4 and/or Pylon carriage chaff/IR counter measures.

QUESTION: In your opinion, to what degree were your test objectives adequate to enable a valid test and subsequent HQ decisions?

TAWC Response (Question #9)



TAWC Comments:

Method was invalid for Tactical evaluation; test plan was completely revised.

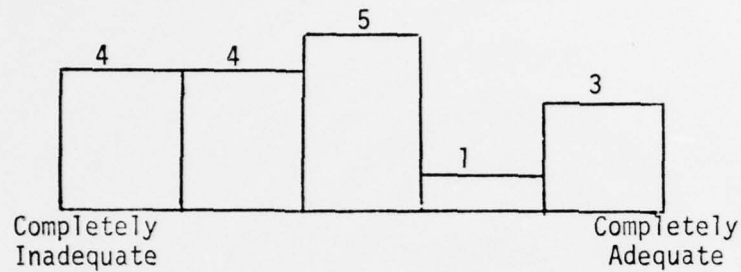
Does anyone read the reports? I had objectives; ASD had none.

The objectives, again, are general; the testing results sell the project.

Objectives too sophisticated for available hardware, forcing much analysis.

QUESTION: How would you rate the time available to plan the test?

TAWC Response (Question #10)



TAWC Comments:

If aircraft Class II Mod's, etc., included as part of "planning," I just barely squeezed by.

Coordination cycles take too long and very little guidance is available prior to the test to allow pre-planning.

TAC is usually several steps behind the developing command and is usually late with the project order; e.g., I received P.O. ten days after ADTC began DT&E/IOT&E.

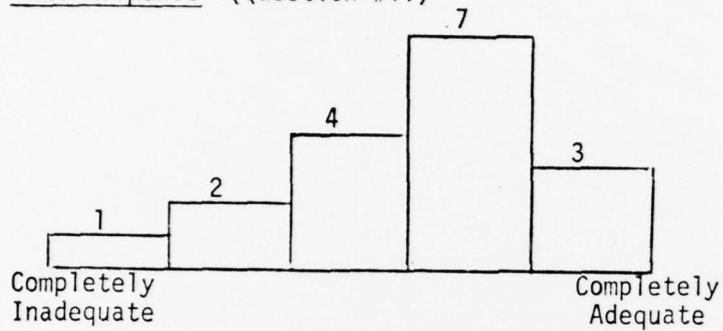
Adequate planning makes actual testing easy.

However, it was done during prime time.

Normally, we have 2-3 weeks; in some cases, we have less.

QUESTION: To what extent were you able to collect adequate data to satisfy all test objectives?

TAWC Response (Question #11)



TAWC Comments:

Duration of IOT&E does not lend itself to realistic maint. and failure data collection.

The time allowed to write and coordinate the final report is much too restrictive.

Navy test and Air Force was dependent on them for all data.

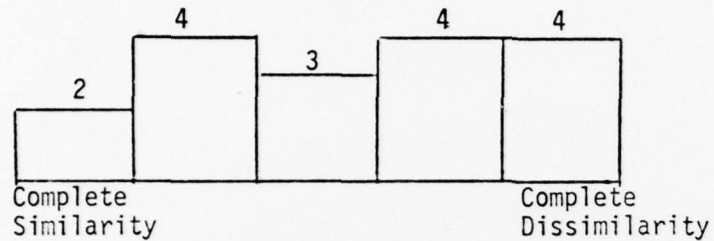
By hook or crook.

One test objective was dropped because of CSAF time constraint.

We do good work.

QUESTION: To what degree do you feel your test environment simulated an actual operational situation?

TAWC Response (Question #15)



TAWC Comments:

Sometimes equipment operators are too well trained.

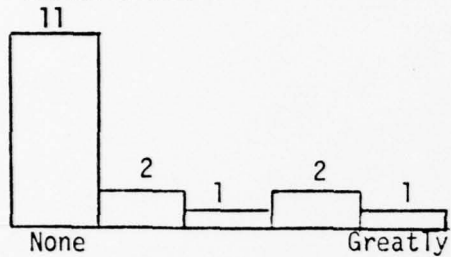
Not all required "real world" simulations available.

Depending on the test, varied from complete dissimilarity to average similarity.

The test facility is primarily a one-on-one system. We need a multiple environment. The test results predict single engagement probability of loss.

QUESTION: In your opinion, to what degree were you restricted by political or other factors from making what you considered the most valid recommendations and conclusions?

TAWC Response (Question #17)



TAWC Comments:

Higher HQ approval stipulated changes in some conclusions.

Item was tied to other programs.

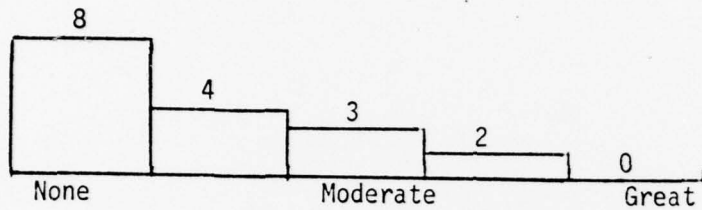
Sample size too restrictive for adequate IOT&E test phase.

It's hard to tell it like it is.

It takes considerable effort.

QUESTION: To what degree did test cost factors restrict your evaluation?

TAWC Response (Question #18)



TAWC Comments:

Time was the biggest factor.

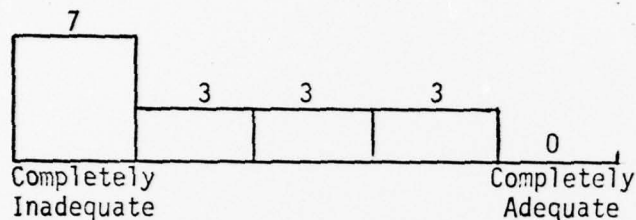
Priority and overtime money--definite problem.

Navy paid for all test support. AF funded TDY, only.

Only so far as having available test assets.

QUESTION: How would you rate the adequacy of time allowed to properly write and publish the report?

TAWC Response (Question #21)



TAWC Comments:

Quality and completeness are the sacrificial lambs of unrealistic suspenses.

Format and dates primary thing--we're cutting on final product.

Generally inadequate--this was an unusual case because timing was based on availability of Navy data--therefore, most preliminary work was completed prior to suspense date being received.

The report time is directed by individual who never wrote or coordinated a report and the following formula applies:

timely reports = great reports = good OER

late reports = bad reports

This grading criteria is easy to understand, simple to follow, and uniform throughout the command.

Thirty work days--usually fifteen days are used for coordination within TAWC.

Difficult to do justice to a complicated test within the thirty-working-day deadline.

SUMMATION OF QUALIFICATION QUESTIONS

QUESTION 1: How did you initially become familiar with the general intent of IOT&E as defined in DOD Directive 5000.1 or AFR 80-14?

ANSWER:

AFSC	TAWC	
2	7	a. OJT/conversation with fellow workers.
3	2	b. Command information/correspondence
9	11	c. Read regulations/directives
0	0	d. Briefed by supervisor.
2	1	e. Other.

QUESTION 2: How many joint DT&E/IOT&E programs have you been associated with?

ANSWER: AFSC: 3.7 (average) TAWC: 2.9 (average)

QUESTION 3: How many have you managed to completion?

ANSWER: AFSC: 2.5 (average) TAWC: 1.7 (average)

QUESTION 4: During what calendar year was your last test completed?

ANSWER: AFSC: 73 (average) TAWC: 73 (average)

QUESTION 6: In which of the following categories would you classify the test item at the time of IOT&E?

ANSWER:

AFSC	TAWC	
6	9	a. Pre-production prototype.
6	8	b. Pilot production item.
0	1	c. Breadboard construction
0	0	d. Commercial off-the-shelf
4	0	e. Other

AFSC COMMENTS INCLUDED AT END OF QUESTIONNAIRE

I believe the support ability is over-emphasized, at the early stages, anyway. Some systems are so shakey, their utility should be determined before the ribbons are tied. Extensive support of a useful capability is more justified than good support of a marginal system. "See how it works first!" That's what IOT&E started out to be.

A. All questions were answered using following base:

1. Program tests were planned, initiated, and partially completed prior to 80-14 revision in '72; i.e., Cat I, II, & III tests used, rather than DT&E, IOT&E, OT&E.
2. Program was concurrent. Production decision made with less than 10% of development testing accomplished.
3. Thus, numerous changes in hardware and software were made throughout and after completion of DT&E and IOT&E.

B. I have not been closely associated with program or project using "new" concept of user preparation of IOT&E test plan.

The concept of having developing and using agency on board and participating actively from program conception through test is invaluable. With their pilots flying on early DT&E sorties, we were able to incorporate changes early during DT&E and only very minor changes resulted from the pure IOT&E sorties.

The IOT&E concept is a vast improvement. However, test personnel require time to learn how to use the system and will make it work much better in the future.

The program experience related in this questionnaire was the first Drone system to complete a joint AFSC/TAC DT&E/IOT&E. I am convinced that user participation in the DT&E/IOT&E (as compared with the DT&E followed by an OT&E) provided a more thorough evaluation of the system and prepared the user to plan and conduct the OT&E.

TAWC COMMENTS AT END OF QUESTIONNAIRE

Two major deficiencies exist for joint IOT&E's:

1. By the time test objectives are received, the test hardware has been bought and the DT&E has been planned. This results in either using a lot of analysis in meeting objectives or attempting to change an existing method of test, often during active testing.
2. When AFSC contracts for DT&E/IOT&E hardware, the IOT&E is seemingly not considered for the production decision. A recent example:

DT&E--200 items
IOT&E-- 15 items

In actuality, the IOT&E input is as important, if not more important, than the DT&E input.

Separate IOT&E testing with adequate assets to meet the IOT&E objectives is essential for an objective and intelligent IOT&E input for a production decision. Along with this, reporting should include sufficient time to present the results.

The test discussed here was the Navy Condor Missile Evaluation. Total test management was vested in the Navy with AF representatives participating to make a subjective evaluation of the weapon's utility to the AF role. The Navy cooperated very well with the AF reps, but because of the numerous differences in test philosophy between the two Services, some of the AF time schedules had to be adjusted.

Independent evaluation is the best way to conduct DT&E/IOT&E. The developing command has too much pride of authorship.

Additional time required to write final reports. This is end product of complete contracting and testing cycle and we're cutting it short to meet unrealistic dates.

Not enough people support assigned to IOT&E.

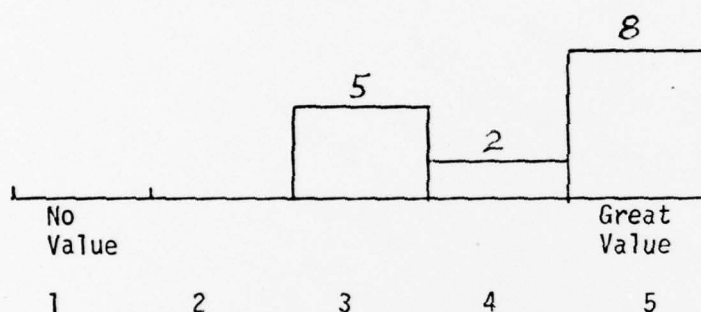
ANNEX D

SAMPLE STATISTICAL COMPUTATIONS

The following is a sample of calculations used in the statistical analysis. These are provided only as an example of the method used and are performed using the responses to Question #5.

The first set of computations was made to determine if a group opinion existed. The null hypothesis (H_0) is that no group opinion exists (i.e., that responses are distributed evenly for all possible choices). The Kilmogorov-Smirnov method is used. (Reference Fundamental Statistical Concepts by Fisher).

AFSC responses for Question #5 were as follows:



An even cumulative distribution of responses would be as follows (i.e., no group opinion):

$$\frac{1}{5} \quad \frac{2}{5} \quad \frac{3}{5} \quad \frac{4}{5} \quad \frac{5}{5}$$

For sample size of 15 yields:

$$\frac{3}{15} \quad \frac{6}{15} \quad \frac{9}{15} \quad \frac{12}{15} \quad \frac{15}{15}$$

Actual responses are:

$$0 \quad 0 \quad \frac{5}{15} \quad \frac{7}{15} \quad \frac{15}{15}$$

The maximum difference: $D_{\max} = \frac{6}{15} - 0 = \frac{6}{15}$

From Table K of reference, $D_c = .30$ for a sample size of 15, and $\alpha = .10$, which provides a 90 percent confidence interval.

If $D_{\max} > D_c$, reject H_0 , indicating that a group opinion does exist.

$$D_{\max} = .4$$

Therefore, reject H_0 .

$$D_c = .3$$

The following calculations were used to test for significant difference of the two sample means from each of the questions common to both groups of program managers. Again, these are done (for example only) using Question #5.

The null hypothesis to be tested is: $H_0: \bar{X}_1 - \bar{X}_2 = 0$

AFSC Response				TAWC Response			
X_i	N	$(X_i \cdot N)$	$(X_i - \bar{X}_1)^2$	N	$(X_i \cdot N)$	$(X_i - \bar{X}_2)^2$	
1	0	0	10.24	0	0	9.61	
2	0	0	4.84	1	2	4.41	
3	5	15	1.44	2	6	1.21	
4	2	8	.04	8	32	.01	
5	8	40	1.44	6	30	1.21	
	<u>15</u>	<u>63</u>	<u>18.00</u>		<u>70</u>	<u>16.45</u>	
$\bar{X}_1 = 4.2$				$\bar{X}_2 = 4.1$			
$N_1 = 15$				$N_2 = 17$			

The pooled estimate of the common variance is given by:

$$s^2 = \frac{\sum (X_i - \bar{X}_1)^2 + \sum (X_i - \bar{X}_2)^2}{N_1 + N_2 - 2}$$

$$s^2 = \frac{18.00 + 16.45}{15 + 17 - 2} = 1.148$$

$$s = \sqrt{1.148} = 1.07$$

Referring to the table of critical values of t, it is found that the value of t for $\alpha = .05$ (95% confidence) is: $t = 1.645$

Therefore, the hypothesis H_0 will be rejected for calculated t values in excess of 1.645. Calculating t provides:

$$t = \frac{(\bar{X}_1 - \bar{X}_2)}{s \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} = \frac{4.2 - 4.1}{1.07 \sqrt{\frac{1}{15} + \frac{1}{17}}}$$

$$t = \frac{.1}{(1.07)(.35)} = .267$$

1.645 > .267; therefore, the hypothesis that no significant difference in means exists is accepted.

ABBREVIATIONS

IOT&E	Initial Operational Test & Evaluation
DOD	Department of Defense
AFTEC	Air Force Test and Evaluation Center
TAC	Tactical Air Command
DSARC	Defense Systems Acquisition Review Council
JCS	Joint Chiefs of Staff
BRDP	Blue Ribbon Defense Panel
AFSC	Air Force Systems Command
DT&E	Development Test and Evaluation
TAWC	Tactical Air Warfare Center
HQ	Headquarters
USAF	United States Air Force
ASD	Aeronautical Systems Division
AFB	Air Force Base
OT&E	Operational Test & Evaluation
DDR&E	Deputy Director of Research & Engineering

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